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EXAMINER

KYLE, MICHAEL J

ART UNIT PAPER NUMBER

3676

DATE MAILED: 12/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/624,338

Applicant(s)

GRONDAHL, CLAYTON M.

Examiner

Michael J Kyle

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 7/22/03.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Claim Objections

1. Claim 5 is objected to because of the word “fee”. Examiner believes this should be changed to, --free--.
2. Claim 17 is objected to because of the limitation “the free end”. Examiner believes this should --the free portion--, to be consistent with the terminology used in claim 9, from which claim 17 depends.
3. Claim 25 is objected to because it is unclear if the leaf seal is being claimed in combination with the support. If it is to be claimed in combination, this fact should be clearly stated in the preamble of the claim. As currently presented, only the intended use (for use with a leaf seal) is claimed. It is noted that any prior art support structurally capable of being as claimed, whether explicitly disclosed by the prior art or not, may be used to read on this claim. Additionally, if the leaf seal is not to be claimed in combination with the support, then all references to the leaf seal structure in the body of the claim should be referred to with “adapted to” or “for” language.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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5. Claims 1, 8, 19, 21, and 23-25, are rejected under 35 U.S.C. 102(b) as being anticipated by Ono (U.S. Patent No. 5,987,879). With respect to claims 1 and 19, Ono discloses a seal assembly comprising a leaf seal (3, 4) with a fixed portion (portion received by 5) that is angled relative to a free portion (portion extending between 1 and 2, in figure 4) thereof, and a support (5). The support (5) supports the free portion, and has a side facing the high pressure side of the seal. The free portion contacts a distal end of the support portion (5) in an operative state. Ono discloses that the seal (3,4) slides in (5). This movement allows for the free portion to contact the support. Ono further discloses a rotary machine (1, 2, are part of a compressor and turbine, which are rotary machines). The seal is between a rotatable (compressor or turbine) and non-rotatable (tube 1 or 2) component.

6. With respect to claims 8 and 23, Ono shows the fixed portion (received by 5) to be positioned substantially perpendicularly to a longitudinal axis of the component to be sealed. Examiner notes that the fixed portion has a perpendicular dimension. The free portion is angled out of plane relative to the fixed portion, and slidably engages the component to be sealed at an angle relative to the longitudinal axis (where 3, 4, contacts 2, in figure 4).

7. With respect to claims 21, Ono discloses the support (5) to have a curved portion (on side of 5, facing inner surface of 2) extending from the distal end to the proximate end.

8. With respect to claim 24, Ono discloses a method of fabricating a seal assembly for a

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contact in an inoperative state. Ono discloses the seal (3, 4) to slide in support (5). This provides for contact between the free portion and the distal end of the support.

9. With respect to claim 25, Ono discloses a support including a mount portion (in figure 4, portion of 5 fixed to tube 1) and a support portion (portion of 5 spaced from 1) including a proximate end and a distal end. The support is adapted to be used with a leaf seal (3, 4) having fixed and free portions. The proximate end is capable of contacting the free portion of the seal in an operative state, and does not contact the free portion in an inoperative state (shown in figure 4).

10. Claims 1, 3-5, 19, 21, 22, and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Dinc et al ("Dinc", U.S. Patent No. 6,173,958). With respect to claims 1 and 19, Dinc discloses a seal assembly comprising a leaf seal (seal shown in figures 9 and 10) with a plurality of staggered leaf seal members (each individual brush of the seal), and a support (74) coupled to the seal, having a portion facing the high pressure side of the seal. A free portion of the seal (portion of the seal between the shaft and support member) contacts a distal end (shown in figure 10) in the operative state, and is out of contact in an inoperative state. The seal has a fixed portion (between the faces of the support) that is angled relative to free portion (portion in contact with 74, in figure 10). The seal is used in a rotary machine.

11. With respect to claims 3-5, 21, and 22, Dinc discloses the support to include a curved surface (on 74) extending from a proximate end of the support to a distal end. The free portion extends tangentially from the curved surface in the inoperative state. The proximate end is

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coupled to a mount portion (70). The free portion is closer to the component to be sealed against (76) in the operative state.

12. With respect to claim 25, Dinc discloses a support (70, 74) with a mount portion (70) and a support portion (74). The support portion includes a proximate end and a distal end. The support is adapted for use with a leaf seal, where the leaf seal has fixed (portion within the support) and free (angled portion shown in shadow in figure 10) portions. The proximate portion of the support contacts the free portion of the in an operative state, and is out of contact in an inoperative state. The fixed portion is angled relative to the free portion (se figure 10).

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

14. Claims 2, 20, and 26, are rejected under 35 U.S.C. 103(a) as being unpatentable over Ono in view of Halowach et al ("Halowach", U.S. Patent No. 4,813,608). Ono substantially discloses a sealing assembly comprising a leaf seal and support as claimed in claims 1, 19, and 26. Ono further discloses the leaf seal to have two layers (3, 4). Ono fails to disclose the leaf seal layers to be made from different materials, where a first material addresses a high pressure side of the seal and a second material addresses a low pressure side of the seal, where the material has a lower coefficient of thermal expansion than the second material.

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15. Halowach discloses a leaf seal assembly (40) comprising two layers of different material with different coefficients of thermal expansion. The two layers are bonded together, such that the different rate of expansion between the two layers causes the seal to bend in a preferred direction, which results in the formation of a tight air seal between adjoining structures (column 2, lines 13-24). It would have been obvious to one having ordinary skill in the art at the time of the invention to modify Ono as taught by Halowach, such that the layers 3, 4 of Ono are made of materials with different coefficients of thermal expansion, so that the differing rates of expansion causes the seal to bend, forming a tight air seal between the structures (1, 2). Examiner asserts that to have the seals bend in a “preferred direction”, as stated by Halowach, the material with a lower coefficient of thermal expansion should be on the low pressure side. This will exert a force towards tube (2) of Ono, thereby increasing the sealing capability.

16. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ono in view of Johnson et al (“Johnson”, U.S. Patent No. 5,108,116). Ono fails to disclose the plurality of staggered leaf seal members (3, 4) to be provided by a single strip of material.

17. Johnson teaches a leaf seal arrangement (10) made from single strip of material. Manufacturing a multi-layered seal from a single strip of material lowers manufacturing costs because the seal can then be assembled in a simpler fashion, as opposed cutting two different layers to length and connecting the layers together to form the seal. It would have been obvious to one having ordinary skill in the art at the time of the invention to modify Ono as taught by Johnson, such that Ono’s seal (3, 4) is made from a single strip of material, in order to reduce

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18. Claims 8-17, 23, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dinc in view of Jackman (U.S. Patent No. 4,720,969). With respect to claim 8, 9, and 23, Dinc discloses a seal assembly comprising a leaf seal member (shown in figure 10) with a fixed portion angled relative to a free portion, where fixed portion is positioned substantially perpendicular to a longitudinal axis of a rotatable component (72). Dinc further shows the free portion to slidably engage and seal against the rotatable component (72, 76). Dinc fails to disclose the free portion to be angled out of plane relative to the fixed portion in an inoperative state.

19. Jackman discloses a leaf seal (106) comprising a fixed portion (between 108 and 75) and a free portion (angled portion between 18 and 75, in figure 3) angled relative to the fixed portion in an operative state. Angling the free portion relative to the fixed portion as Jackman does provides a better seal between the two components, because the pressure increases, the seal will be brought into tight contact with component it seals against. It would have been obvious to one having ordinary skill in the art at the time of the invention to modify Dinc as taught by Jackman, in order to provide a better seal against the component. In Dinc, an increase in pressure would tend to deflect the seal out of contact with the component being sealed against. However, if modified as taught by Jackman, an increase in pressure would more deflect the seal into tighter contact with the component being sealed against.

20. With respect to claims 10 and 11, the combination of Dinc and Jackman discloses a support (108 in Jackman) for supporting the free portion of the seal facing a high pressure side of

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end is thinner than the proximate end, where proximate end is in contact with the free portion in the inoperative state.

21. With respect to claims 12 and 13, Jackman shows the support to include a curved surface from the proximate end to the distal end (figure 4, right side of 108). Jackman shows the support portion (108) to be coupled to a mount portion (104) that mounts the support to a stationary component.

22. With respect to claims 14 and 15, Dinc discloses the free portion to be closer to the rotatable component (76) during the operative state than in the inoperative state. A holder (70) mounts the seal assembly to a stationary component and includes a projection (portion extending radially downward in figure 10, left side of the holder) that protects the free portion.

23. With respect to claims 16 and 17, the combination of Dinc and Jackman teaches the fixed portion to be provided by an arcuate member in each leaf seal member. Examiner notes that because the seal extends around a rotary shaft, it is essentially circular, which will include arced portions. Dinc shows the free end portion to be circumferentially parallel to a surface of the rotatable component.

24. Claims 2, 20, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dinc in view of Halowach. Dinc substantially discloses a sealing assembly comprising a leaf seal and support as claimed in claims 1, 19, and 26. Dinc further discloses the leaf seal to have two layers (shown in figure 10). Dinc fails to disclose the leaf seal layers to be made from different materials, where a first material addresses a high pressure side of the seal and a second material

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addresses a low pressure side of the seal, where the material has a lower coefficient of thermal expansion than the second material.

25. Halowach discloses a leaf seal assembly (40) comprising two layers of different material with different coefficients of thermal expansion. The two layers are bonded together, such that the different rate of expansion between the two layers causes the seal to bend in a preferred direction, which results in the formation of a tight air seal between adjoining structures (column 2, lines 13-24). It would have been obvious to one having ordinary skill in the art at the time of the invention to modify Dinc as taught by Halowach, such that the layers of Dinc are made of materials with different coefficients of thermal expansion, so that the differing rates of expansion causes the seal to bend, forming a tight air seal between the structures (1, 2). Examiner asserts that to have the seals bend in a “preferred direction”, as stated by Halowach, the material with a lower coefficient of thermal expansion should be on the low pressure side. This will exert a force towards flange (75, 76) of Dinc, thereby increasing the sealing capability.

26. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dinc in view of Jackman as applied to claim 9 above, and further in view of Halowach. Dinc and Jackman fail to disclose the leaf seal layers to be made from different materials, where a first material addresses a high pressure side of the seal and a second material addresses a low pressure side of the seal, where the material has a lower coefficient of thermal expansion than the second material.

27. Halowach discloses a leaf seal assembly (40) comprising two layers of different material

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direction, which results in the formation of a tight air seal between adjoining structures (column 2, lines 13-24). It would have been obvious to one having ordinary skill in the art at the time of the invention to modify Dinc and Jackman as taught by Halowach, such that the layers of Dinc and are made of materials with different coefficients of thermal expansion, so that the differing rates of expansion causes the seal to bend, forming a tight air seal between the structures (1, 2). Examiner asserts that to have the seals bend in a “preferred direction”, as stated by Halowach, the material with a lower coefficient of thermal expansion should be on the low pressure side. This will exert a force towards flange (75, 76) of Dinc, thereby increasing the sealing capability.

28. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dinc in view of Johnson. Dinc fails to disclose the plurality of staggered leaf seal members (3, 4) to be provided by a single strip of material.

29. Johnson teaches a leaf seal arrangement (10) made from single strip of material.

Manufacturing a multi-layered seal from a single strip of material lowers manufacturing costs because the seal can then be assembled in a simpler fashion, as opposed cutting two different layers to length and connecting the layers together to form the seal. It would have been obvious to one having ordinary skill in the art at the time of the invention to modify Dinc as taught by Johnson, such that Dinc's seal (3, 4) is made from a single strip of material, in order to reduce manufacturing costs. Johnson further discloses the leaf seal members to be fixed by a weld.

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30. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following references are cited to further show the state of the art with respect to angled seals and supports: Smith et al, Corsmeier et al, Buckshaw et al, and Fellenstein et al.
31. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael J Kyle whose telephone number is 703-305-3614. The examiner can normally be reached on Monday - Friday, 8:30 am - 5:00 pm.
32. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Judy Swann can be reached on 703-306-4115. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.
33. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

mk

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